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Opioid overdose following surgery or pain treatment: A missed opportunity for intervention

Patients who undergo surgery or pain treatment may later present with opioid overdose. Health care visits provide an opportunity to prevent repeat overdoses, recurring health visits, and premature death.

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ABSTRACT

Background: British Columbia has been the epicentre of the opioid overdose crisis since declaring it a provincial public health emergency in 2016. Effective strategies to reduce mortality are currently lacking.

Methods: This retrospective observational study included patients who presented to local emergency departments with opioid overdose during a 12-month period (1 July 2018 to 30 June 2019). We extracted demographics and overdose history and characterized hospital visits for pain or surgery within 24 months prior to the overdose.

Results: We identified 1104 patients who presented with overdose, of which 77% were male (n = 854), with a mean age of 41 across all patients (SD = 12). Within 24 months prior to the overdose, 50% of the cohort had a health care encounter for pain, and 5% had presented for surgery or a surgical procedure. Most patients (57%) had experienced a prior overdose (median = 2 prior overdoses; range = 1 to 28). Patients who had a prior health care encounter for pain or surgery were more likely to have had a previous overdose than those who did not have an encounter (66% vs 47%, respectively; $P < .00001$). Among those who had a previous overdose, there was a significant association between having prior pain or surgery visits and multiple prior overdoses ($P = .0006$).

Conclusions: Prior health care encounters for pain and surgery are common among people who present with opioid overdose. These visits are opportunities to prevent repeat overdoses, recurring health visits, and premature death.

Background

Canada is currently experiencing an opioid overdose crisis that is having devastating consequences for individuals, communities, and the health care system.[1] Since British Columbia declared a provincial public health emergency in 2016, the province has struggled to gain control of the epidemic as opioid overdoses and deaths continue to rise, as evidenced by the largest number of deaths ever recorded in 2021.[2] Within BC, the highest number of paramedic-attended overdoses, emergency department visits, and illicit drug toxicity deaths have occurred in the Metro Vancouver region.[2,3] In downtown Vancouver, St. Paul's Hospital in Providence Health Care is uniquely situated at the centre of Canada's opioid overdose crisis. The emergency department serves one of Canada's

poorest urban neighborhoods and receives high volumes of overdose-related visits.

There is an urgent need to identify strategies to mitigate the opioid crisis and provide effective intervention. Many people who die of opioid overdose have recently interacted with the health care system, which represents an opportunity for intervention. In one analysis, 77% of people had contact with the health care system in the year before they died from overdose,[4] and nearly 40% had contact within a month.[5] Forty-five percent had previously sought treatment specifically for acute or chronic pain,[4] and the risk of subsequent fatal overdose increases in those who present to the emergency department with a nonfatal overdose.[6] Currently, the role of recent surgery in patients who present with opioid overdose is unknown but may represent an opportunity to identify those at risk and to intervene.

We aimed to characterize the frequency of health care encounters for surgery, pain, or prior overdose within the preceding 24 months in patients who presented to Providence Health Care emergency departments with an opioid overdose. We hypothesized that most patients in our cohort would have had health care encounters in the 24 months prior to opioid overdose, which may represent an opportunity for intervention.

Methods

This retrospective, observational cohort study was conducted with approval from the University of British Columbia Clinical Research Ethics Board (approved 22 July 2019; H19-02011) and the Providence Health Care Information Access and Privacy Office.

Study population

We included all patients who presented to Providence Health Care emergency departments (St. Paul's Hospital or Mount Saint Joseph Hospital) with an opioid overdose over a 12-month period (1 July 2018 to 30 June 2019). This period was chosen to provide continuity with the 2017 data presented in a previous analysis of opioid overdose deaths in Vancouver.[4] We excluded non-opioid-related overdoses (e.g., alcohol, cocaine), presentations for substance use and/or misuse that did not result in an overdose, and those that did not meet the Providence Health Care definition of an overdose, which required a coded chart diagnosis of "heroin overdose/intoxication," "other opioid overdose/intoxication," or "recreational drug overdose not otherwise specified." Overdose events were further confirmed by the presence of either "opioid overdose" or "use of naloxone (resulting in reversal of overdose)" in the medical record. If a patient had multiple overdoses during the study period, we used the most recent event.

Data collection

We extracted available demographic data (including age, gender, and postal code) from the patient's electronic medical record. We identified health care system encounters for pain management or surgery within 24 months prior to the overdose event. When available, we identified details about prior surgery (specialty, invasiveness, type, and timing) prior to the overdose event.

We identified patients with a history of pain, as previously described in Vancouver Coastal Health's *Response to the Opioid Overdose Crisis in Vancouver Coastal Health* report.[4] A pain visit was defined as one in which the primary reason for the visit included pain or where pain was listed in the nursing notes or physician assessment as the primary reason for the visit, other than for chest pain. For example, if the diagnosis code was reported as "swelling/redness," the episode was included if pain was also listed as a primary complaint. We extracted information about the cause, type (acute or chronic), duration, and location of pain, and the highest rated severity (0–10). If more than one visit for pain was identified, we used the most recent visit but also noted other pain visits. Finally, we recorded the number of overdose presentations within the previous 10 years.

Statistical analysis

Data were described using percentages, means, standard deviations, medians, and interquartile ranges. We used a Fisher exact test (Social Science Statistics online calculator[7]) to compare the incidence and number of prior overdoses in patients with and without prior pain or surgery visits. Data presentation and analysis were conducted using Microsoft Excel version 16.57 (Microsoft Corporation, Redmond, WA) and Tableau version 12.1 (Tableau Software, LLC, Seattle, WA).

TABLE 1. Characteristics of patients presenting to Providence Health Care emergency departments with an opioid overdose, stratified by health care encounter, July 2018 to June 2019.

Patient characteristics		Overall cohort N = 1104	Prior visit for pain or surgery N = 556	No prior visit for pain or surgery N = 548
Fatal overdose, n (%)		4 (0.4%)	1 (0.2%)	3 (0.5%)
Age (years), mean (SD)		41 (12)	41 (12)	39 (13)
Gender, n (%)	Male	854 (77%)	428 (77%)	426 (78%)
	Female	241 (22%)	124 (22%)	117 (21%)
	Nonbinary or transgender	9 (1%)	4 (1%)	5 (1%)
No fixed address, n (%)		418 (38%)	214 (39%)	204 (37%)
Out-of-province postal code in chart, n (%)		11 (1%)	3 (0.5%)	8 (2%)

Results

Population characteristics

We identified 1104 patients who presented to Providence Health Care with an opioid overdose, with a mean age of 41 (SD = 12); 77% were male (n = 854). Few data on population characteristics were missing (< 5%) except for postal code and type of pain (acute or chronic), which were missing in 38% and 24% of patients, respectively.

The characteristics of patients with and without prior health care encounters for pain or surgery were similar **[Table 1]**. The geographic distribution of opioid overdose patients who presented to Providence Health Care is shown in **Figure 1**; 38% did not have a fixed address. During the study period, the highest numbers of overdose presentations occurred in March and June 2019 **[Figure 2]**.

Health care encounters for pain or surgery prior to overdose

Within the 24 months prior to the overdose event, 50% (547/1104) of the cohort had a health care encounter for pain and 5% (56/1104) presented for surgery or a surgical procedure. Among those who had a health encounter for pain and/or surgery, 79% (437/556) of these occurred within 12 months of the event (437/1104 = 40% of the cohort) **[Figure 3]**.

Surgical encounters

Among patients who had surgery within 24 months prior to their overdose, 25% (14/56) had multiple procedures. Most surgeries (88%) were minor. The most common procedures were endoscopy (30%) and orthopedic surgery (38%) **[Figure 4]**. Of those who had surgery within 24 months of their overdose, 84% (47/56) had also visited a Providence Health Care facility for pain.

Pain-related encounters

Pain-related encounters within the 24 months prior to an opioid overdose were typically recurrent, with 39% of patients (215/547) having more than one pain visit during that period (it is unknown if visits were related). The most common complaint

FIGURE 1. Geographical distribution of patients experiencing opioid overdoses presenting to Providence Health Care emergency departments.

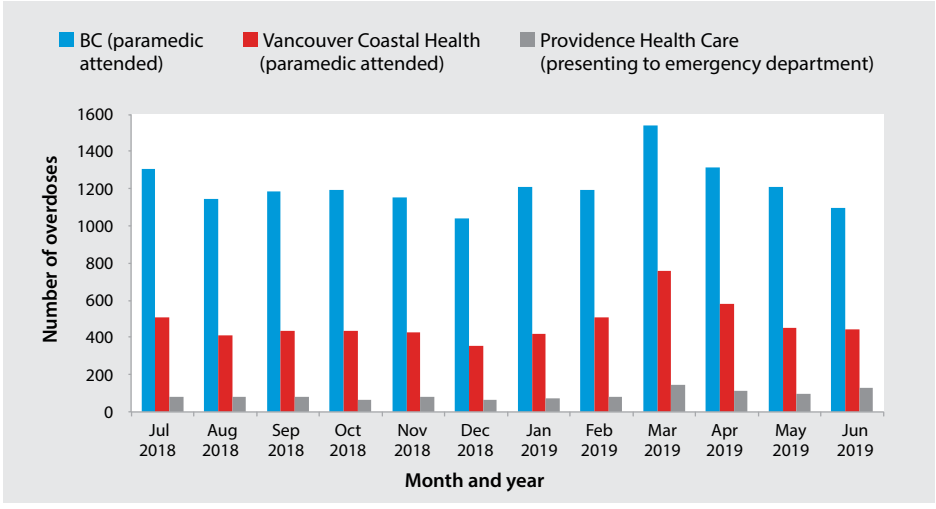

FIGURE 2. Monthly opioid overdose presentations at Providence Health Care emergency departments (data from this study) compared with overall BC and Vancouver Coastal Health paramedic-attended overdoses, July 2018 to June 2019.

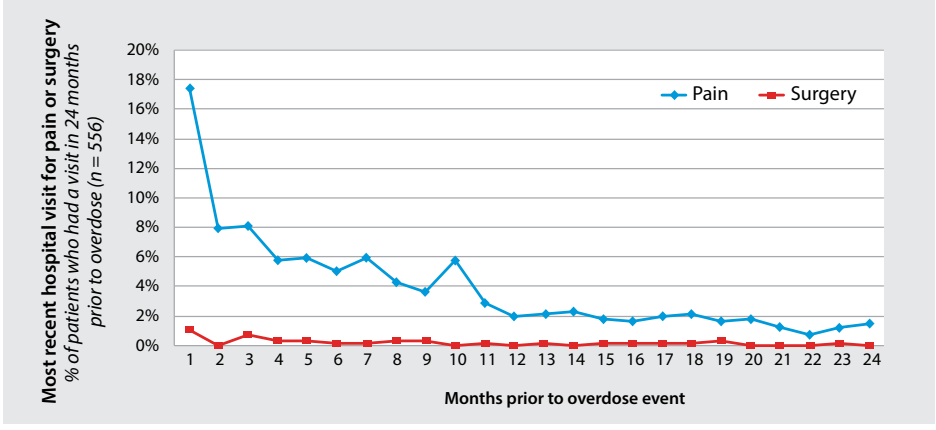

FIGURE 3. Months from health care encounter to opioid overdose in population that had previous pain or surgery visits.

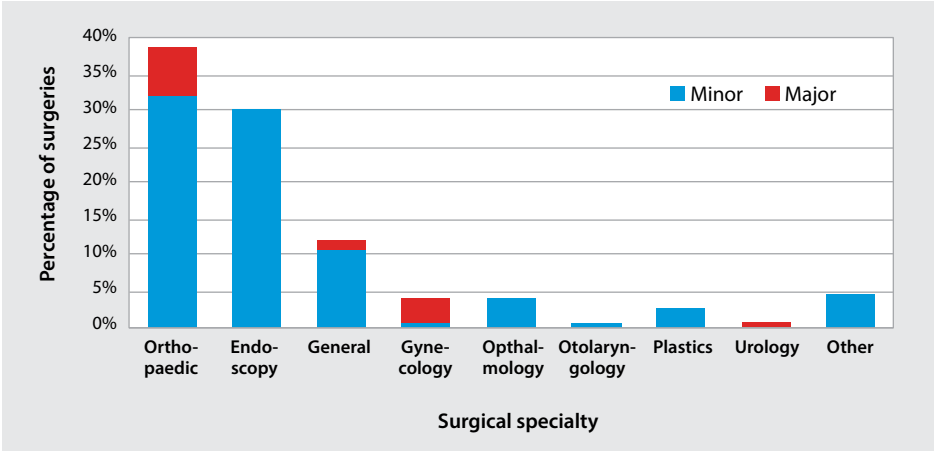

FIGURE 4. Type of surgical encounter, stratified by invasiveness.

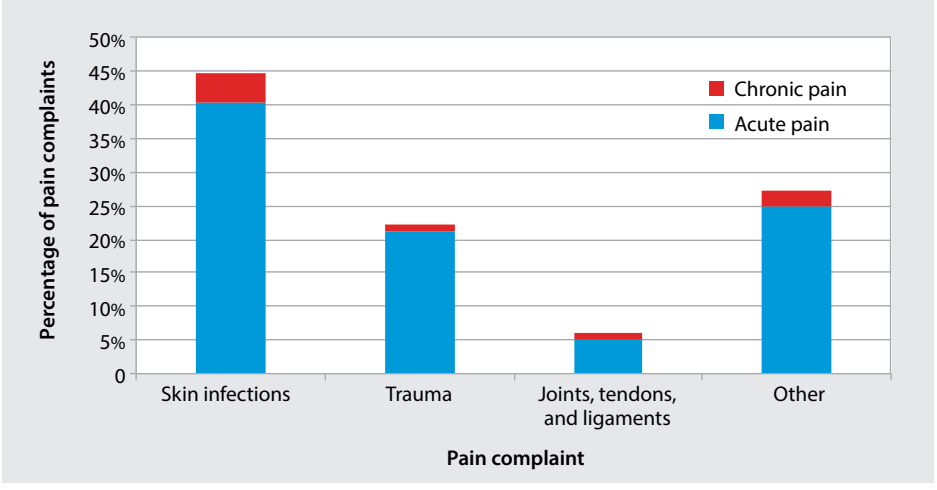

FIGURE 5. Health care encounters related to pain, stratified by duration, type (acute or chronic), and main complaint.

Skin infections include cellulitis, limb infection, and redness/swelling. Trauma includes assault, fracture, and laceration. Joints, tendons, and ligaments include joint separation or effusion, ligament or tendon tears, injuries, and inflammation. Other includes postoperative, abdominal/bowel, back, drug injection/ingestion, eye/ear/dental, fall, head injury/headache, withdrawal, and gynecology.

TABLE 2. Patient history of previous overdoses within prior 10 years of index overdose event, stratified by health care encounter.

Patient overdose history	Overall cohort N = 1104	Prior visit for pain or surgery N = 556	No prior visit for pain or surgery N = 548	*P**
Previous overdose, n (%)	626 (57%)	367 (66%)	259 (47%)	< .00001†
- Number of previous overdoses, median (interquartile range); range	2 (3); 1–28	3 (4); 1–28	2 (2); 1–25	–
- Number that had > 1 previous overdose, n (%)	404 (65%)	260 (71%)	149 (58%)	.0006†

*Fisher exact test, †$P < .05$

was pain due to a skin infection such as cellulitis, swelling and redness, or an arm or leg infection; most were acute **[Figure 5]**.

Prior overdose events

More than half the cohort (57%, 626/1104) had presented to a Providence Health Care emergency department with a prior overdose, and multiple overdoses were more common in those who also had previous visits for pain or surgery **[Table 2]**. Those patients who had prior health care encounters for pain or surgery were more likely to have had a prior overdose than those who did not have an encounter (66% vs 47%; 367/556 vs 259/548) ($P < .00001$). Furthermore, among those who had a previous overdose event, there was a significant association between having prior pain or surgery visits and having multiple prior overdoses ($P = .0006$).

Discussion

Our results indicate that people who present with an opioid overdose have frequently interacted with the health care system for pain, surgery, or prior overdose in the 24 months leading up to their event. Furthermore, people with previous health care encounters are also more likely to have experienced recent nonfatal overdoses compared with those with no recent health care encounters. Our findings highlight multiple opportunities to identify those patients at risk for subsequent opioid overdose and potentially intervene to reduce harm and promote health in this vulnerable population.[5,6] In particular, opioid management for patients presenting for surgery or acute pain episodes represents a strategic opportunity.

Consistent with our results, a previous study found that 54% of the BC Provincial Overdose Cohort visited the emergency department in the year before their overdose, compared with 17% of the controls.[5] However, our study cohort contained more people who had no fixed address (38%) than reported by the BC Provincial Overdose Cohort (17%),[1] which may reflect the unique vulnerabilities of our specific population. Similar to the BC Provincial

Overdose Cohort, the proportion of our cohort that had no fixed address included more males and younger patients than the proportion that had a listed address.[1]

Our results are particularly relevant given that BC has the highest numbers and rates of opioid overdose events and related deaths in the country,[8] which have been further compounded by the COVID-19 pandemic.[9] There is often a complicated relationship between people suffering from pain (chronic or acute) and opioid use or misuse.[4] People are more open to behavior change in times of transition or life health events,[10] including interactions with the health care system for surgery and pain management. The frequent visits for pain management for skin infections that we identified in our study are not unexpected, given that our cohort included a high proportion of people who injected drugs and thus were at increased risk for skin and soft tissue infections.[11,12] In addition, recent nonfatal overdoses are a clear indication of increased risk for subsequent overdoses, both nonfatal and fatal.[13]

Patients at risk for opioid use disorder face specific challenges regarding the time of surgery or pain management for several reasons, including tolerance of traditional opioid medications and opioid-induced hyperalgesia.[14,15] Moderate to severe pain and inadequate pain management may play a role in the development of persistent postoperative pain.[16] A previous study found that most patients with nonfatal opioid overdoses had filled an opioid prescription within 6 months prior to the event.[13] Our study cohort most commonly underwent relatively minor surgery, which would not typically require large doses of postoperative opioids.

To prevent further harm and future overdoses in this vulnerable population, every health care interaction should be seen as an opportunity to intervene. Many emergency departments, including at Vancouver General Hospital, are now initiating buprenorphine/naloxone when patients present with adverse effects of opioid use.[17,18] The more widespread use of buprenorphine microinduction has made this possible because patients can be started on low-dose buprenorphine/naloxone at presentation without first withdrawing from full opioid agonists and without precipitating withdrawal.[19,20] This requires direct referral to a community site or the patient's primary care provider the following day to continue treatment. Inpatients can also be initiated on opioid agonist therapy while in hospital if the patient is motivated.[21,22] When patients with opioid use disorder or chronic opioid use present for surgery or pain management, their stage of change should be explored, and a referral to addiction medicine, if available at that centre, should be considered if the patient is contemplative or prepared to change. If an addiction medicine service is not available at the centre, the patient should be directed to speak with their family physician and to supportive resources in the community to facilitate interventions in those patients who are ready to consider making a change. Health care providers in the emergency and surgical wards could be trained in brief motivational interviewing for substance use to help patients make changes.[23,24] All patients who use opioids and have other risk factors should be provided with a naloxone kit for opioid overdose.[25,26] Given that most of the patients in our cohort had most often presented for endoscopy or orthopaedic surgery, those units could consider having naloxone kits available to distribute to all patients upon discharge.

Several strategies and recommendations have been proposed to reduce the risk of postsurgical chronic pain and persistent opioid use. Multidisciplinary Transitional Pain Clinic services have been implemented in Canada, including recently at St. Paul's Hospital and Vancouver General Hospital, to identify patients who are at high risk of complex postoperative pain as early as possible and to provide a customized pain management strategy perioperatively and opioid taper once the patient is discharged from hospital.[27] Family physicians are also a key support for high-risk patients following discharge, particularly when a Transitional Pain Clinic is not available. Recommendations and best practices from Choosing Wisely Canada that are relevant to chronic and perioperative pain and opioid management are summarized in **Table 3**,[28-32] and the optimal durations of opioid prescription after specific subtypes of surgery are

TABLE 3. Recommendations for perioperative opioid and chronic pain and symptom management.[28-32]

Recommendation	Year	Source
Prolonged use of opioid analgesia beyond the immediate postoperative period or other acute pain episode is not recommended.	2022	Choosing Wisely Canada: Canadian Association of General Surgeons[28]
Do not continue opioid analgesia beyond the immediate postoperative period or other episode of acute, severe pain.	2022	Choosing Wisely Canada: College of Family Physicians of Canada[29]
Do not routinely discontinue buprenorphine perioperatively or in the context of acute pain requiring additional opioid analgesia.	2022	Choosing Wisely Canada: Canadian Society of Addiction Medicine[30]
Do not initiate or escalate opioid doses for chronic noncancer pain before optimizing non-opioid pharmacotherapy and nonpharmacologic therapy.	2021	Choosing Wisely Canada: Canadian Society of Hospital Pharmacists[31]
Do not use opioids without considering opioid sparing strategies and multimodal analgesia in patients after injury.	2021	Choosing Wisely Canada: Trauma Association of Canada[32]
Do not routinely prescribe benzodiazepines or other sedative-hypnotics for promotion of sleep without a trial of nonpharmacologic interventions.	2021	Choosing Wisely Canada: Canadian Society of Hospital Pharmacists[31]

TABLE 4. Optimal length of opioid pain medication prescription after common surgical procedures for opioid-naive patients.[33]

Surgical category	Optimal length of opioid prescription
General surgery procedures	4–9 days
Breast and gynecologic procedures	4–13 days
Orthopaedic and spine procedures	6–15 days

outlined in **Table 4**.[33] Comprehensive recommendations for managing patients with concurrent pain and opioid use disorder in primary care, including diagnosis, risk factors, opioid tapering, and induction of buprenorphine, are available from the BC government.[34,35]

Study limitations

Our study has several limitations, including those that are inherent to a retrospective chart review, such as incomplete or missing data. Our data were collected from a single provincial health authority, which may not be generalizable to other centres or provinces. We were also unable to determine interactions outside of Providence Health Care, which may have underestimated the frequency of interactions. Our definition of encounters for pain was used in previous studies but may not have fully captured this complex phenomenon. Furthermore, we relied on information for people who had overdosed but survived to the emergency department and did not capture those people who died prior to reaching hospital. Importantly, we were unable to identify risk factors for overdose after pain or surgical health care encounter because our study did not contain a control group of patients who had not overdosed; this is a critical area for future study. In addition, given the observational nature of our study, we cannot determine whether recent surgery or pain directly resulted in an opioid overdose.

Conclusions

Our study supports local evidence that people who present with opioid overdose have frequently had health care encounters within 12 to 24 months prior to the event.[4] Our study also provides a novel description of this vulnerable population presenting to our hospital system with an opioid overdose and indicates that recent encounters with the health care system for either surgery or pain are common prior to overdose. Our results further identify an additional opportunity to intervene in this population.

Our results indicate that people who present with an opioid overdose have frequently interacted with the health care system for pain, surgery, or prior overdose in the 24 months leading up to their event.

Future research should focus on identifying effective interventions and explore the relationship between surgery, postoperative opioid use, and subsequent overdose. ■

Competing interests

None declared.

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